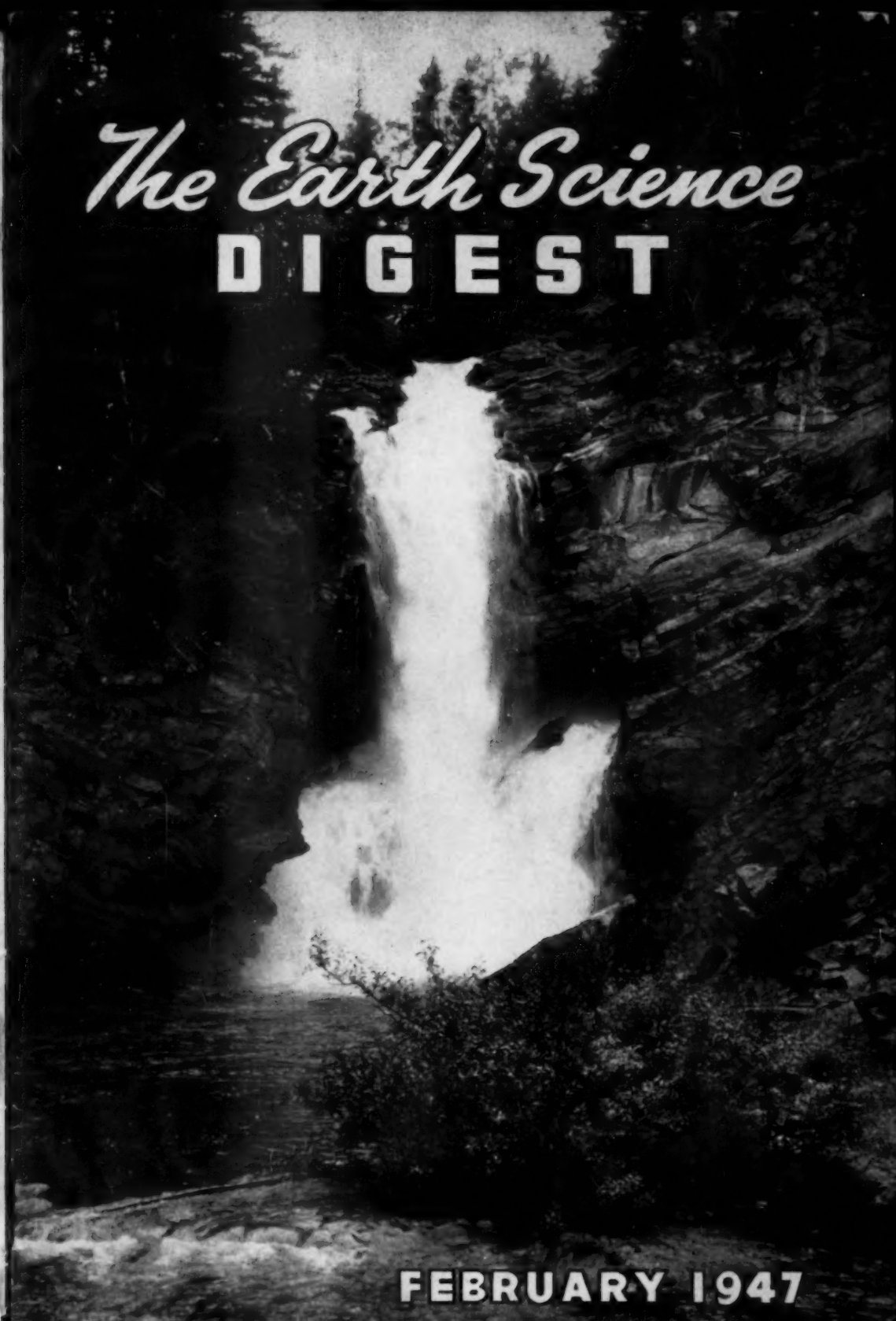
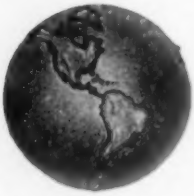

The Earth Science
DIGEST
FEBRUARY 1947

The Earth Science Digest

Box 57  Omaha 3, Nebraska

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Cover Photo

Cover photo this month is Trick Falls in Glacier National Park. The river above the falls separates and goes underground later emerging as two falls. A natural bridge is in the process of formation and if conditions remain the same, one should form within a reasonable length of time. Photo was taken by W. D. Keller of the University of Missouri.

Contents

Collecting calcite and celestite crystals in Sylvania sandstone (Wisconsin till sheet on top) at Rockwood, Michigan.

Michigan Minerals

Henry P. Zuidema
Wayne University, Detroit

The collector of minerals in Michigan has two distinctly unlike regions in which to pursue his hobby, each of which has ample material to engage his interest season after season.

The entire lower peninsula of the state, from the Ohio-Indiana line to the Straits of Mackinac, lies in the area of only slightly disturbed Paleozoic strata of the Michigan "basin," with exposures ranging in age from Silurian to Pennsylvanian. Over a large area, the only exposures found by the collector are in quarries and open mines and clay pits where the overburden of glacial drift has been removed, but there are isolated outcrops such as those fringing the shores of upper Lakes Michigan and Huron.

The eastern part of the upper peninsula is underlain by the older Paleozoics, ranging in age from the Devonian limestones of the Straits area to the Cambrian (Lake Superior) sandstones in the north, the sandstones forming spectacular cliffs along the "pictured rocks" region of the Superior shore.

The Paleozoic rocks, in cross-section, form a basin structure of superimposed "butter bowls",

Sylvania sandstone (99 per cent silica when washed) exposed beneath the Wisconsin till sheet and river gravels at Rockwood, Michigan. Locality for fine celestite and calcite crystals.

the rocks dipping gently toward central Michigan where are found the youngest of the system, the coal-bearing strata of the Pennsylvanian, surrounded concentrically by the outcrops of the older rocks, the entire system having a thickness of several thousand feet.

In sharp contrast, the western portion of the upper, of northern peninsula, consists of pre-Cambrian rocks which form a southern extension of the Canadian Shield. These are complex rocks of the Algonkian and Archean systems, containing the ore bodies which gave Michigan first place for years among the states in the production of iron ore and native copper.

The above brief sketch of the bedrock of Michigan provides the clue to the great diversity of minerals collected in the state and to the unique position Michigan has occupied as a source of mineral wealth.

Michigan led all the states from the 1840's to 1901 in the production of iron ore, now having lost first position to Minnesota. But Michigan is still second largest producer and supplies about 20 per cent of all iron ore mined in the United States. The tonnage in 1944 was 13,693,377, having a value of $38,537,000. Minnesota produces about 50 per cent of the nation's total and therefore about 70 per cent of the country's iron ore is transported on the waters of the Great Lakes

to the furnaces of the steel centers of the lower lakes area.

Origin of the iron ore has been the subject of intensive research through the years and the geologic history of the "iron country" now emerges as a series of dramatic events of the remote past.

The ancient, rugged terrain of vast mountains of the Superior region has long since been worn down by age-long cycles of erosion, but the so-called "iron ranges" of today are still at a higher elevation, generally, than the areas immediately adjacent. The ranges of Michigan proper are the Marquette, the Menominee and the (eastern) Gogebic, which extends into Wisconsin. Associated ranges are the Vermilion, Mesabi and Cayuna of Minnesota and the Steep Rock, Flint Lake and Michipocoten of Ontario.

Briefly, the stages of iron ore accumulation and concentration were:

1. Deposition in a basin or series of basins of great thicknesses of sediments, including volcanic debris. These chemical deposits included the primary, or original iron formations of iron carbonate with interbedded layers of chert. Unaltered remnants are still found.

2. Great earth convulsions accompanied by both the outpouring of lavas on the surface and the invasion of the sediments by great masses of molten rock from below.

3. The movement of water through the carbonate of iron formations was facilitated by the intense deformation and resultant folding and faulting, and the water converted the carbonate into the oxides of iron, limonite and hematite, but did not alter the interbedded chert.

4. Further alteration and enrichment of the iron formation in some localities where the chert was dissolved or was replaced by iron oxide, thus producing material classed as iron ore, i. e., deposits containing at least 48 per cent metallic iron.

Where heat and other metamorphic agencies were active, iron and silica of the original iron carbonate-chert layers combined to form grunerite, and the rock is often a grunerite schist Micaceous hematite was formed when the oxidized iron formations were metamorphosed, the interbedded chert becoming red by reason of impregnation by minute hematite particles. Specular hematite was formed in a few localities in veins by hot, iron-bearing solutions derived from, or heated by, magma.

Mineralized water under proper conditions deposited in cavities the many beautiful mineral specimens found in the iron country of Michigan—marcasite, barite, calcite, pyrite, manganese and iron oxides, with magnificent combinations of two or more of these.

Private collections in Michigan, notably that of Mr. A. N. Goddard, of Detroit, contain splendid examples of banded gray micaceous hematite and blood-red jasper. This rock is called jaspelite, and good examples come from Jasper Hill, on the eastern edge of Ishpeming. A polished section shows how the harded jasper cracked and was shattered by intense folding, while the softer hematite "flowed" under the extreme pressures.

Hematite, the most important iron ore, frequently is found in graceful, curved and fluted forms which would charm the

most discerning student of art forms. These pieces are the delight of hundreds of collectors.

For more than 40 years of her early period, as an ore producer, Michigan was the nation's leader in copper production, but by 1944 had fallen to sixth place in the face of competition from areas where copper is found not only in shallower deposits but is associated with other metals such as gold, nickel and platinum. The Michigan deposits, however, have produced some silver and gold. Some of the mines now are 10,000 feet deep, on the dip, and the region is classed as a high-cost producer mainly for this reason.

During 1945, copper production was 44 million pounds from crude ore and 16 and a half million from old tailings, the year's output having a total value, according to Bureau of Mines figures, of nearly 11 million dollars.

The copper is native copper and is mined in a belt two to four miles wide and more than 100 miles long in the Keweenaw series of the Algonkian rocks, the principal mines being located along the Keweenaw Peninsula, which juts northeasterly into Lake Superior. The series consists of thousands of feet of basalt flows, with felsite conglomerates common in the upper and lower parts, and including felsite and quartz porphyry flows, as well as some sediments made up of felsitic debris.

The rocks of the copper range dip northwest, forming the south limb of the Lake Superior syncline, and reappear on Isle Royale, 50 miles out in the lake and to the north. The copper outcrops of the region were worked by prehistoric man and copper, as a trade article, was spread throughout North America, as evidenced by the discovery of copper weapons and ornaments in moundbuilder and later Indian graves over a wide area.

The crude methods of the early miners included pouring of cold water over heated rock so that it would crack and permit removal of the metal. Prehistoric mining pits are still found, occasionally with tools left at the workings.

When the white man began development of the mines, skilled miners were brought from Cornwall, England, whose remote ancestors traded tin with the Phoenicians for the making of bronze, prime necessity of early civilizations.

At least 90 per cent of the copper of Michigan has been mined in six ore bodies, one in the conglomerate, the others in the amygdaloid.

With the closing of many mines, fine specimens of native copper, including those showing crystallization, are not as plentiful as they once were and many of the best are out of dealers' hands and in the major mineralogical collections.

Unique specimens from the copper country are found in the collections of the Cranbrook Institute of Science, Bloomfield Hills, Michigan, and in the Goddard private collection in Detroit. Unusual are specimens of blood-red calcite, the color due to saturation with copper. This rare material was obtained from the Allouez mine. Of outstanding beauty are specimens of calcite with delicate inclusions of copper; prehnite stained with copper; copper associated with arborescent crystals of silver,

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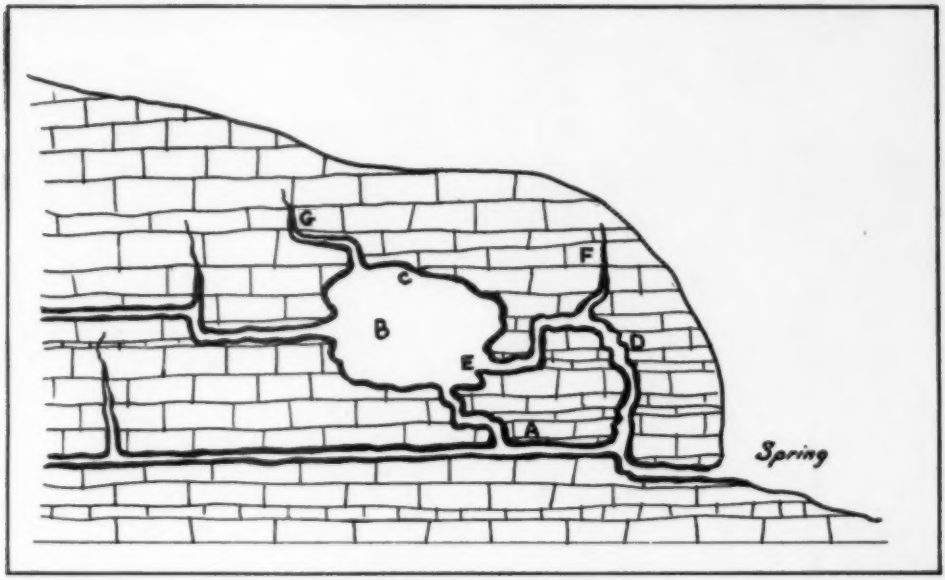

Cross sectional view of an Ebb and Flow spring.

A Missouri Ebb and Flow Spring

W. D. Keller

When one hears, "Does he (it) have rhythm," it is expected that reference has been made to a youth of bobby-sox age. Few persons would expect rhythm to be an attribute of a cold water spring issuing from the foot of a limestone bluff, but if it is an ebb and flow spring it will have just that—it will exhibit a rhythmical increase and decline in the volume of its flow. Just for clarity, let it be repeated that the ebb and flow spring need furnish nothing more than cold, clear, hard water; it is not a geyser, not hot, not associated with any tidal, volcanic or diastrophic phenomena, nor with an artificial agent.

Probably not more than 24 ebb and flow springs have been located in the United States, of which 9 are in Virginia, 5 in Missouri, 3 in Tennessee, 2 in West Virginia, and 1 each in Nevada, New Mexico, Pennsylvania, Utah, and Wyoming. These figures have been taken from the references listed at the end of this article.

One of the Missouri springs was recently visited by the writer and a short resume of the trip in to it and a description of the spring will follow. This spring is called the Rymer Spring or the Ebb and Flow spring on Jack's Fork of Current River. It is located about 8 miles northwest of the town of Birch Tree in Shannon County. A state-maintained, good gravel highway, well marked leads to within about 2 miles of the spring, but from this point on the auto traveler takes season, pot luck, no holds barred, sky and erosion limits, with the road.

The old story about mountaineer transportation in to the mine applies here also. You drive as far as your car will climb steep hills, straddle high road centers, jump "chuck" holes, and deeply washed gullies. Then you get out at the last place wide enough to turn the car around and walk on down where the old road was. In the old story you ride a burro, but no Missouri mules are staked out near here. After walking as far as possible you are almost there, but to clear the last 200 yards you swing in on wild grape-vines. To reach the ebb and flow spring you walk down the road until you come to the ford acros Jack's Fork river. A well-built, anchored "corduroy" wooden driveway lies across Jack's Fork, which would be excellent for car or foot travel in the summer season when the river was not high. In fact, the entire road would not be so bad during the vacation season, but the writer selected to visit Ebb and Flow spring after a rainy spell in late fall and that was the time when he needed a Bailey bridge across the river now high in flood.

Actually we located a leaky, water-logged "skiff" (boat) without oars, which we were able to pole across the river, and we truly maneuvered the boat into place the last 50 feet by grasping overhanging tree limbs and grape vines. A beautiful, privately owned, recreation camp of about 20 cabins is on the spring side of the river. The entire region is typically scenic of the dolomite region of south Missouri and I recommend the trip to anyone who is not restricted to a short 20 or 30 minutes in which to race in to the spring area and then speed back to the main highway in a cloud of chert gravel and flint sparks.

Ebb and Flow spring has an estimated flow of over 2,000 gallons per minute at low stage. At high stage the estimated flow was about 10,000 gallons per minute (from reference by Bridge). The interval between crests varies from one hour to 45 hours with an average of about 10 hours. The writer believes that the intervals are longer, and differences between high and low stage volumes greater in dry seasons than at times of heavy rainfall because the cycle was shorter and there was less deviation in flow when visited by the writer during a week of rainy weather. A gurgling sound occurs during the change in volume.

Authentic records of the frequency and sizes of the flood stages have been made by an automatic recorded maintained temporarily at the spring. Details of the spring's "autograph" are in Dr. Bridge's reference.

Cause of the Periodicity

Briefly, the flood stage of an ebb and flow spring probably represents the emptying of a large underground cavity by siphon action in addition to its normal, low stage flow. This explanation we owe to one J. T. Desaguliers who proposed it for ebb and flow springs in 1724. The writer does not know who first discovered the action of a siphon, or where, but no doubt Mother Nature has been utilizing siphons and "flush tanks" eons before man made his discovery.

In the drawing below one may follow the ebb and flow sequence. Normal low-water flow fills crevice A which discharges as an ordinary spring. After

cavity B fills to above the height of C in channel D, the excess water is siphoned to the level of E. The presence of other channels like F and G which contribute either water or air to the system will tend to modify the ebb and flow interval, the volume, or the siphon efficiency which may result in irregular or erratic ebb and flow behavior.

The student of ground water and its work as shown in springs, caves, cave deposits, agates, replacements and petrifications can not consider his study complete until he has "sat out" a cycle of an ebb and flow spring.

REFERENCES

Ebb and flow springs in the Ozarks, Josiah Bridge, Bulletin No. 7 Technical Series, Missouri School of Mines and Metallurgy, Rolla, Missouri, 1923.

The large springs of Missouri, H. C. Beckman and N. S. Hinchey, vol. 29, 2nd series, Missouri Geological Survey and Water Resources, Rollo, Missouri, 1944.

Hydrology, Oscar E. Meinzer, Editor, McGraw-Hill Book Co., New York, 1942, p. 428.

Imperial Valley Show

The Imperial Valley mineralogists have completed plans for their second Gem and Mineral exhibit scheduled for March 29th and 30th in the Central Junior College auditorium at El Centro, California. The first show was held in May of 1946 and attracted such a widespread interest that the two Imperial Valley clubs, the Imperial Lapidary Guild, and the Imperial Valley Gem and Mineral Society, have decided to give an annual show

The show will feature an exhibit of semi-precious stones. Noteworthy mineral specimens will also be exhibited. There will be a dark room with a large and varied display of fluorescent material.

Leo DeCelles and Sam Robinson, presidents of the two clubs have named George Moore, Leon Miller, L. G. "Blackie" Beleal, and Ira Huffman as chairmen of managing committees on housing, floor arrangements and lighting. Miss Eva Wilson is head of publicity.

A cordial invitation is extended to all earth science enthusiasts to attend.

NEXT MONTH

Next month we will feature an article on "Diastrophism" by Prof. Keller. Judging by reader comment each one of Prof. Keller's articles is eagerly awaited for. An article about a Canadian field trip will be of especial interest. Explorer Vic Shaw is back from an extended trip into the Superstition Mtns. and has sent us an article giving the uncolored facts about the Lost Dutchman Mine. This will be the first of twelve articles about famous lost mines.

The San Salvador Mercury Mine

W. D. Keller

The price of quicksilver on October 17, 1945 was quoted on the New York market as $100 per 76 lb. flask, but on January 26, 1947 it had dropped to $90 per flask. A 10 per cent change in price over two years is not too serious, generally speaking, but a drop in price during the particular last two years when bacon, overalls, soap, and cough syrup soared in cost, causes one to look twice. No wonder the producers of quicksilver in the U. S. are lying awake nights and are anxious to do something about it. The cause for the reversal of the quicksilver market was the recent arrival of something like 20,000 flasks of Italian mercury and prospects of more to come. Twenty thousand flasks of mercury is more than a half year's supply for our country.

This article is not going to grind an axe for either the domestic miners or our Italian cobelligerents (after they quit Hitler) for the writer neither owns quicksilver mining stock nor has any relatives in the Italian peninsula. He thought it might be interesting to the readers to get a casual, but first hand description of the Abbadia San Salvador mercury mine (reported the second largest in the world in Professor Bateman's book on Economic Mineral Deposits) and mill at Monte Amiata, Italy, which the writer visited on October 17, 1945.

We were returning to the U. S. Army University at Florence, Italy, from an "assigned mission" in southern Italy, and took a short time out to detour via Monte Amiata which lies about 90 miles north of Rome. As the name indicates the mine is on a mountain (elevation about 5200 feet) which is a prominent part of a generally north-south trending range about 30 miles inland from the west coast. Entrance to the property by way of car is through a one lane road closed by an arched iron gate which is flanked by a high iron trellis on each side. Brick, stone, and some timber buildings house the offices, laboratory, mill, and distillation plant of a sizeable organization. No significant war damage was apparent to the writer but some equipment needed replacing and the technical staff was incomplete. The writer is indebted to Dott. Adriano Valduga of the geology staff at the Italian University of Florence, who was a member of the visiting group and who acted as interpreter while the writer sought information about the place.

The rocks in the immediate vicinity are Tertiary sediments, marls, sandstone, clays, argillaceous limestone, and trachyte. The sediments have been faulted and fractured along major systems along which the ore solutions traveled. Another characteristic of the sediments deserves special mention. According to Professor Carlo Migliorini, geologist at the University of Florence, they are a part of the Tertiary formation called "Argille Scagliose", (scaly clays) which he interprets as being a tectonic rubble. His interpretation is that during Tertiary diastrophism the newly deposited

and weakly lithified sediments which were raised in zones of active deformation slipped and rolled before the active folds and faults to give rise to a formational "rubble." This formation is composed characteristically of a thorough mixture of different lithologic units, of fossil zones (Mesazoic to late Tertiary), and is entirely and completely haphazard in its local structural attitude. It gives rise to a characteristic landslide-type "undecided" topography. The ore solutions which permeated the Monte Amiata region found diverse local channels in the jumbled Argille Scagliose formation and deposited their cinnabar load in innumerable small openings.

Workmen at the mine reported that the ore occurred chiefly in limestones and calcareous clay (obviously most susceptible to reaction and attack by the ore solutions) but it was also distributed irregularly in the sandy clay and trachyte. The mine was being worked to a depth of about 450 feet—but I have a question mark after this figure in my notes.

The only ore mineral recognized was cinnabar in fine grain. It was characteristically red and heavy in some high grade "show" specimens given me. Tenor of ore was reported to be about 5 per cent cinnabar. No reliable information was available on the reserves—they were said to be "unlimited."

Ore was delivered to the mill in dump cars holding about 2 cubic yards. It was crushed to pass through a 4-inch opening and then dried. After drying it was conveyed to batteries of stills which were heated by producer gas made from wood cut from the nearby mountains; the stills appeared to be in excellent condition. The gas generators were housed adjacent to the distillation units. Probably pyrolignic by-products were produced, or were available for production, but language difficulty made me uncertain of this point. About 1100 men were reported to be employed in the mine and mill. Fumes from the stills were exhausted in a high stack on the mountain about 1/8 mile from the plant.

Production was reported to be about 2 tons mercury per day and was then (October, 1945) being stored! Question was raised a second time about its disposal, and the answer was confirmed that there was little domestic consumption of mercury in Italy then, that exportation was almost impossible because of transportation difficulty, and consequently the mercury was being stored until opportunities for marketing were improved. I have no information on how much had been stored or how long production continued at the rate of 2 tons per day. But a little simple arithmetic, using conservative assumptions of production since post-hostilities in Italy, suggests that there is (or was) **molto** mercury in Italy waiting to be marketed.

Central Iowa Meeting

The Central Iowa Mineral Club met on Friday, February 7, at the Des Moines Y. M. C. A. The speaker was John Sanders. His subject was "Fluorescence of Minerals". The talk was illustrated with several types of visual equipment.

On Sunday, February 9, club members visited the home of Dr.

and Mrs. E. J. Harnagel and viewed their collection of rocks and minerals.

Vanartsdalen's Quarry

SOUTHHAMTON TOWNSHIP
BUCKS COUNTY, PENN.

At one time famous for its titanite and graphite, this quarry is rapidly becoming exhausted. It is a limestone quarry, the limestone being intruded by gabbro. It is at this contact that most of the minerals are found.

At the time of his visit, the writer found the following minerals: apatite, small green crystals and grains up to ¼ inch; graphite, small crystalline plates up to one inch in size in the limestone; gypsum, coating on the limestone; microcline, bluish-gray cleavage masses; phlogopite, brown plates in the limestone; pyrite, small crystals in limestone; pyroxene (diopside, augite, etc.), crystals and grains in the gabbro, limestone, and at the contact; quartz, masses, gray-blue; titanite, wedge-shaped monoclinic crystals up to one inch in length at the contact zone; wernerite, light gray crystalline masses; zircon, small crystals, rarely found.

For the location of this quarry consult Gordon's Mineralogy of Pennsylvania (pp. 164-165), or address the writer in care of this magazine.

MICHIGAN MINERALS

(From Page 6)

and manganite crystallized on barite.

Datolite from the copper country is often exquisitely tinted by copper and fine specimens appear in both Cranbrook and Goddard collections. A boulder picked up at a copper mine would have caught the eye of none but the most skilled collector, yet when polished the stone was found to contain delicate silver lacework in a datolite ground mass, the whole as charming and colorful as a spring scene by Corot.

"Skulls" are copper pieces formed about boulders in the conglomerates and these may have silver on them in the form of drawn wire due to some peculiarity attending deposition of the silver.

Popular items from the Lake Superior region are the colorful thomsonites, as handsomely tinted as bits of Paisley shawls and from the same area come the chlorastrolites, or greenstones.

Although superseded by other states in the production of metallic minerals, Michigan has retained leadership in the production of the non-metallic minerals from the Paleozoic rocks of the lower peninsula. In 1930, for the first time, the combined value of the non-metallics produced exceeded the combined value of Michigan iron ore and copper.

Collectors of halite, or rock

salt, in the Detroit area need only to go 1,100 feet below the ground and there find 25 miles of "streets" carved out of salt beds 400 feet thick deposited during Silurian time. In 1944 the state produced 4,300,000 short tons of salt from mines and from brine, or 27 per cent of the nation's salt and Michigan has held first place in this category for many years.

Next in value to iron in terms of annual production is petroleum, in which Michigan ranks eleventh among the states. Gypsum, often yielding such interesting collectors' items as "pencil ore" in addition to massive forms in many colors, is found in the Mississippian strata both at Grand Rapids and across the state at Alabaster.

The Michigan gypsum deposits produced 552,600 short tons in 1944, and production is increasing, assuring maintenance of the state's place as second among the states. Chief uses of the mineral have been gypsum board, plaster, and sound-proof stages for the motion picture industry.

The "big three" among the minerals of the Detroit area are limestone, brine from local wells, and coal imported from adjacent areas. These basic raw materials are transformed into chlorine, dry ice, caustic soda, calcium carbonate, soda ash and sodium bicarbonate each of which is in turn used in thousands of industrial processes. Ultimately the Michigan salt and limestone, combined with coal, appears in such diverse substances as chemicals, paper, textiles, rayon, cellophane, soap, ink, paint, glass, sulfonamide, baking powder, pharmaceuticals and even fire extinguishers and for inflators for the life-rafts of Byrd's South Pole explorers.

Specimen material from the Paleozoic rocks includes the fine celestite crystals of delicate blue found in the Sylvania sandstone of Rockwood, Mich., which is nearly pure silica and is widely used for making table glassware. Associated with the celestite in the sandstone vugs is nailhead calcite. The dolomite of the Monroe quarry, south of Rockwood, frequently contains doubly terminated scalenohedrons of calcite.

Rarely, diamonds have been found in the glacial drift of Michigan, brought from some unknown outcrop in Canada by

the continental glaciers, and still awaiting discovery by the explorer seeking mineral wealth in the north.

The Michigan Mineralogical Society has just published its 1946 Yearbook which describes collecting localities in the southeastern Michigan and northern Ohio region and contains unusually fine illustrations of typical minerals of the area. The yearbook was published by the Cranbook Institute of Science, Bloomfield Hills, Mich., where the society meets monthly, and may be obtained for 30 cents a copy. The publications committee was James William Bay, chairman and editor; E. Lillian Mihelcic, editor of the society's Hand Book; Hugh H. Millar, editor of the MMS directory, and Henry P. Zuidema, editor of The Conglomerate. The society will be host at Cranbrook next summer to the Midwest Federation of Geological Societies, of which John F. Mihelcic, former MMS president, is the new president.

Letters to the Editor

Gentlemen:

I want to thank you for the complimentary copy of the December issue of E. S. D. Each and every article I assure you was read with interest. It is a very instructive and worthwhile publication. I join Robert Morris of Lisbon, Ohio in saying "please keep the magazine an earth science digest".

Marguerite Hillsman
507 Santa Fe,
Dallas, Texas.

Gentlemen:

Please enter a 16 month subscription for the American Museum of Natural History, New York City, New York.

Faxon Subscription Agency,
Boston, Mass.

Dear Sirs:

Please find enclosed a Postal Money Order to cover my subscription to E. S. D.

Contrary to some of the ill-advised complaints some of your readers have turned in, many of my friends and I are very well pleased with the magazine and I wish you every success.

Very truly yours,
Erwin W. Carls,
Star Rt., Box 53,
Wrightwood, Calif.

Gentlemen:

In your December issue your photo on page 18 was of a volcano near Grants, New Mexico —not Lander, Wyoming. I have visited this place several times and am certain that the site is in New Mexico and not Wyoming. In fact I have a photo of the rock that is almost identical with the one on page 18. On page 4, "Flourissant" is not the correct spelling of the town's name. It is correctly "Florissant". Errors or no errors I really enjoyed the December issue and am looking forward to more articles as good as the ones in December. You have a start on a magazine that should be of interest to every mineral and fossil collector.

Yours very sincerely,
L. J. Whittaker,
Gallup, New Mexico.

Dear Sirs:

I recently sent in my subscription to the Digest. I received the December 1946 copy a few days ago and am very much pleased with it. I have the November copy that was given to me by a friend and would like to know if it will be possible to get any of the back numbers. After reading the two copies I

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Four Corners Rock Club Organizes At Durango, Colo., Meeting Jan. 24

At a meeting held Friday evening, Jan. 24, at Marvin's Rock Shop, situated on highways 550 and 160, in Durango, Colo., organization of the Four Corner's Rock club was effected.

The Four Corner's Rock club will solicit its membership from residents of the four corners area of southwestern Colorado, northwestern New Mexico, southeastern Utah and northeastern Arizona, and its roster will include commercial rock dealers, collectors, rock hounds, and others who are interested in earth science, or mineralogy, geology or archeology. Membership will not be limited.

Chosen as president of the organization for its first year was Kenneth Owens of Animas City; vice-president is Myrle Hall of Animas City; secretary is H. C. Brockman of Durango; and treasurer is W. E. Barber of Durango.

The publicity committee of the newly-formed rock club is composed of Leo R. Brewington, chairman; Marvin Ellsbury and Carl Hudson. Brewington is a Durango newspaperman, while Ellsbury and Hudson are commercial rock dealers of the Four Corner's country, Ellsbury residing in Durango and Hudson in Animas City.

Program committee chosen to head the group, consists of Mrs. Ethel Stafford of Durango as chairman; and Mrs. Kenneth Owens of Animas City and Chris Bilder of Durango.

Rev. Homer Root of Durango, assisted by Mrs. Marvin Ellsbury

of Durango and Mrs. Chris Bilder of Durango, are preparing the by-laws for the new organizition, which will be read at the next meeting, to be held Monday, Feb. 3, in the basement rooms of the Durango Methodist church.

The club plans to hold meetings regularly on the first Monday of each month, and special meetings, field trips, lectures and socials on specially-announced dates.

Purpose of forming the club is to promote and foster interest in the earth sciences, rocks, minerals, etc., and to bring together all those parties interested in getting outdoors on trips to explore the many colorful areas in the four corner's country adjace to Durango, Farmington, Cortez, and Blanding. Lectures, papers, picture shows, and other such programs will be featured in winter months.

The club will sponsor an annual show, after organization has been completed and their work is underway, and will also hold auctions, at which collectors will be invited to become purchasers.

W. E. Barber won the door prize at the first organization meeting given by Marvin's Rock Shop. It was a beautiful ore specimen containing mica and burrel crystals and having a felspar base.

LETTERS TO THE EDITOR

(From Page 15)

am very sure my wife and I will get a great amount of pleasure from your magazine and will keep the copies for future reference.

If you would care to send any extra copies I would be glad to circulate them among the members of our club, The Snohomish County Mineral Society. We have a very active club of 94 members.

Yours truly,
Harry E. Bonner,
3413 Grand Ave.,
Everett, Washington

On The Discovery of an Exciting New Species

By Harrell L. Strimple

The author became interested in geology while a high school student in Casper, Wyoming, but actually never pursued the study too strongly until 1935. A chance visit with Dr. L. R. Laudon, then at the University of Tulsa, started an intensive drive that has lasted for eleven years. Dr. Laudon suggested looking for what was then considered the rarest fossil in the middlewest—crinoids (ancestrial to the star-fish). Within two weeks a few calices (bodies without arms attached) were found.

Several promising outcrops were located but nothing really spectacular developed until one day my wife, my friend Mr. Tom Tarr and myself went to the quarry of the Dewey Portland Cement Co. In a small exposure of the basal shale of the Dewey limestone formation a diminutive beast that I was certain must be a complete crinoid was found. Careful search yielded seven complete specimens and several calices. The calyx was no larger than the head of a match and the surface of the specimens appeared porous—quite like some bryozoa.

This was too unusual to wonder about so we drove on to Tulsa and found Dr. Laudon at home. He became as excited as we were at the peculiar little forms

(To Page 22)

Our Future Policy

During the past few weeks we have undergone an extensive reorganization. Because of this the February issue is not quite as large as preceding issues. However, the March issue and all following issues will have a minimum of 40 pages. As advertising space increases, we will increase the number of pages of reading matter proportionally. We are anxious to run articles that are of genuine lasting interest. We would like to have our readers inform us of the particular type of articles they desire.

New Staff Member

This month we welcome to our staff Robert W. Rispler. Mr. Rispler will assume the duties of Managing Editor. We have been trying in every way possible to increase the quality of the Digest. Each month we plan to increase the size of the magazine and to better the content. In addition to adding a staff member this month we changed printers. This issue and all succeeding will be printed by the Ludi Printing Co. of Wahoo, Nebraska. Ludi's are quality printers and will do everything possible to help us get the magazine out on time.

CLASSIFIED ADVERTISEMENTS

Rate 5c per word. Minimum advertisement $1.50. All ads must be in our office on the tenth of the month preceding date of issue.

BOOKS and MAGAZINES

MOUNTAINS - DESERT - SEASHORE. Every interesting wrinkle of Mother Earth is described, pictured and mapped in this handy new Scenic Guide series. Northern California, Southern California and Nevada are available now. Price $1.00 each. All three for $2.50. **SCENIC GUIDES, Box 288, Susanville, California.**

WANTED! Copies of the August and September 1946 Earth Science Digest. Will pay 40c each for August and 35c each for September. Must be in fair condition. Write: **Mr. Mason, c/o The Earth Science Digest.**

WANTED. Two copies each of the August and September 1946 Earth Science Digest. Must be in good condition. Query for rates. **R. W. Rispler, c/o The Earth Science Digest, Box 57, Omaha 3, Nebraska.**

FOSSILS

IOWA UNDER THE SEA. Life as it existed before man. Pre-historic sea fossils as taken from the prairie clay hills of Iowa. 25 assorted specimens for $1.00, postage paid. They are very interesting. **Glenn S. Michell, Rockford Floyd Co., Iowa.**

INDIAN CURIOS, RELICS

4 VERY FINE INDIAN ARROWHEADS $1.00 - 4 tiny perfect bird arrowheads $1.00 - 1 Ancient Tomahawk $1.00 - 2 Flint Skinning Knives $1.00 - 1 Large Flint Hoe $1.00 - 2 Spearheads $1.00 - 10 Arrowheads from 10 states $1.00 - 20 Damaged Arrowheads $1.00 - 10 Fish Scalers $1.00 - 10 Hide Scrapers $1.00 - 4 Perfect Saw edged arrowheads $1.00 - The above 11 offers $10.00 Postpaid - 10 Beautiful Seashells from Gulf of Mexico $1.00. List Free. **LEAR'S, Box 569, Galveston, Texas.**

METEORITES

FOR $1.00 we will give a one inch nickel iron meteorite from Henbury, Australia, and send our educational Mineral Bulletin for one year, nine issues. **W. Scott Lewis, 2500 Beachwood Dr., Hollywood 28, California.**

MINERALS

25 BEAUTIFUL, colorful Ozarks, 2½" specimens, including 3 cutting and polishing materials, blue and brown chalcedonies, rose and green jasp-agates, red jaspers, drusy and milky quartz crystal clusters, calcites, onyx, breccias, oolites, crinoids, coquinas, and vari-colored flints. Sent postpaid for $2.00. **John Jennings, Eureka Springs, Ark.**

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MISCELLANEOUS

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I collect Historical and antique engineering instruments. Write to Bob Millard, Box 150 Ely, Nevada giving complete description. Will trade for or purchase instruments; tell me your hobby.

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On The Discovery of an Exciting New Species

(From Page 18)

and hesitated for an hour to pronounce them crinoids. It should be remembered that very few specimens of Pennsylvanian crinoids were known.

The species proved of unusual interest because although the genus was known from all over the world, this was the first to be found with complete arms attached. It was described as **Allagecrinus strimplei** Kirk. Much progress has been made in these studies since that time.

Oklahoma Meeting

J. Lewis Renton of Portland, Oregon, past president of the Mineralogist Publishing Company, was guest of the Oklahoma Mineral and Gem Society at a special meeting on January 30, 1947.

Mr. Renton showed colored slides of Thunder Eggs from California and the famous Pridy Ranch in Oregon; agatized and opalized wood; moss and plume agate; and fossils.

These beautiful slides were enjoyed by members of the Society and a large group of guests.

MINERAL QUIZ

Jerome M. Eisenberg

Name the mineral species of which the following are varities:

1. Alexandrite
2. Argentine
3. Bowenite
4. Carbonado
5. Chalcotrichite
6. Chlorophane
7. Eloeolite
8. Endlichite
9. Freibergite
10. Geyserite
11. Indicolite
12. Josephinite
13. Magnesiochromite
14. Nemalite
15. Phosphorite
16. Selenite
17. Sericite
18. Steatite
19. Thulite
20. Withamite

ANSWERS: 1) Chrysoberyl, 2) calcite, 3) serpentine, 4) diamond, 5) cuprite, 6) fluorite, 7) nephelite, 8) vanadinite, 9) tetrahedrite 10) opal, 11) tourmaline, 12) nickel-iron, 13) spinel, 14) brucite, 15) apatite, 16) gypsum, 17) muscovite, 18) talc, 19) zoisite, 20) epidote.

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